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The first conference of Junior Scientific Workers of the Institute of Combustible Minerals, Academy of Sciences USSR, was held at the institute in 1952 to hear and discuss reports on the experimental investigations conducted by junior scientists and postgraduates of the institute in the fields of the genesis, chemistry, petrography, and technology of solid combustible minerals. Representatives of industry participated in the conference.

R.N.Smirnov, in his report "Chemism and Kinetics of the Oxidation of Moscow Basin Coal With Nitric Acid," presented a critical review of existing methods for studying the structure of coals and described his own method of oxidation with nitric acid. He showed that the composition of brown coal from the Moscow Basin includes high molecular compounds with a branched structure as well as compounds of low molecular weight, and showed that acids of the aliphatic and aromatic series, and also nitrophenols, are obtainable as the products of coal oxidation with nitric acid.

The discussion which followed presentation of the paper revealed some shortcomings of Smirnov's work, namely: (1) that the study of the effect of nitric acid on coal is insufficient, and (2) that the method of analyzing outgoing gases is not precise, since it permits a partial escape of the gases.

On the other hand, it was noted that the oxidation method developed and applied by the author permits the investigation of a considerable portion of the organic mass of coal and the obtaining of a number of valuable products for organic synthesis. This is not only a rational method for structure studies, according to the discussion, but also a method for the industrial processing of coal.

According to some comments during the discussion, Smirnov established the peculiarity of the oxidation of coals depending on the concentration of moisture adsorbed in them. He showed that the surface changes which take

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place during the process of coal drying play an important role in the process of oxidation. If, for example, the coal is dried to a constant weight, the reaction of oxidation would cause ignition of the coal.

The conference decided that since the work is the result of extensive experimental investigation it is of great scientific interest. The conference outlined certain possibilities for the use in the chemical industry of products obtained by the method described.

The paper "Chemical Composition of Shale Gasoline Obtained by the Method of Thermal Dissolution," presented by N.A.Davtyan, dealt with the results of a many-sided study of gasoline obtainable by thermal dissolution of the organic part of shales. It was recognized in discussion that this paper represented the first thoroughgoing investigation of the products of thermal dissolution, and, in respect to the products of semicoking and the products of hydrogenation of coals and tar, no investigation of all types of hydrocarbons has ever been conducted in such detail as was done by Davtyan.

The conference stated in its decision on Davtyan's paper that the author satisfactorily employed the latest chemical and physical methods of investigation. The conference recommended continuing the study of the products of thermal dissolution of shales and the products obtainable by other processes for production of synthetic liquid fuel.

The report "Determination of the Depth of Oxidation Zones in Coal Deposits" was delivered by I.V.Yeremin, who established the possibility of utilizing the petrographic features of the organic substance of coal and the minerals occurring in coal, to determine the thickness of the oxidation zone and to find the parts of this zone which differ in the extent of coal oxidation.

The author described the modifications in the properties of coals under the effect of oxidation in the conditions of natural occurrence, and the methods used for determining the extent of coal oxidation. Admitting the complexity of these methods and the difficulty of their application under field conditions, he suggested new methods which may be used under actual working conditions in mines and by coal-prospecting groups. A number of the most characteristic and easily determined external features inherent in weathered coals have been used as a basis for determining the approximate degree of coal oxidation. These features are as follows: (1) presence and character of iron hydroxides, (2) presence and character of carbonates, (3) difference in the luster of coal on the surface of separation crevices and in fresh fractures, and (4) the strength of the coal and presence of clay formations.

Using the luminescence proximate method developed by I.I.Ammosov and N.I.Babinkova for determining the characteristic of coals, the author demonstrated in practice the possibility of effective application of this method for classifying coals from the zones of weathering. The results thus obtained permitted laying out the weathering zone for each object under study and showing on a color diagram the difference between the oxidized and nonoxidized portions of coal.

V.P.Yermakova, in her report "Luminescence Analysis of Sapropelic Coals," demonstrated the considerable advantages of this method of analysis. The conference highly praised Yermakova's achievements in the field of luminescence microscopy and recommended further study of sapropelic coals by new methods of petrography jointly with chemical investigations.

Another report on luminescence analysis was delivered by N.I.Babinkova, who discussed the results of applying this method for determining the characteristic of the properties of coals and concluded that the method may be used under both laboratory and field conditions and gives good results in studying the coals of complex deposits.

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A.S.Savel'yev devoted his paper to an investigation of the structure of humic acids, using in his work the method of hydrogenation. He conducted experiments with three samples of humic acids separated from peat and from two varieties of brown coal -- earthen and lustrous types. Out of hydrogenates of each sample, he separated products similar in their chemical nature: carbonic acids, phenols, neutral compounds, and bases. The latter were obtained only from humic acids of peat, which contain a considerable amount of nitrogen. The major components subjected to investigation were the neutral compounds. Some of them were soluble in ether; others had no such property. Concentrations of carbon and hydrogen higher than those in the initial humic acid were found in the neutral part, insoluble in ether. This, according to the author, indicates that the formation of more condensed products takes place in the process of hydrogenation together with decomposition of the molecules of humic acids.

Analysis of the ether-soluble neutral oils of a hydrogenate showed that their molecular weight and the ratio of carbon to hydrogen in the organic substance increased with the stage of coal formation, evidently, the author stated, due to an increase in the condensation degree of the structural units of humic acids.

The major conclusion made by the investigator was that the hydrocarbons obtained upon hydrogenation of humic acids consist of condensed aromatic rings and side chains, differing from each other by the relationship between the content of side chains and nuclei; the nucleus of the molecule of humic acids is considerably more complex.

The paper created the general impression that the author established a number of interesting regularities in the transformation of humic acids during the process of coal formation, and obtained new data on their structure. It was recommended that more attention be paid to evaluating the quantitative side of the process.

The paper "The Kinetics of Reducing  $\text{CO}_2$  Depending on the Concentration and Velocity of the Flow of Reacting Gas" was presented by P.N.Galushko, who established a number of regularities as a result of experimental investigations. In particular, she found that the rate of  $\text{CO}_2$  reduction is a linear function of the  $\text{CO}_2$  concentration, i.e., the process represents a first-order reaction.

The conference decided on a recommendation that the author continue development of the theoretical side of the process, conduct investigations at increased pressures, and widen the range of temperatures and objects of investigation.

T.M.Ravikovich presented a review of contemporary data on the relationship between the structure and motor properties of gasoline, demonstrating the importance of studying in detail the chemical composition of fuels for carburetor engines in connection with their knock characteristics. The conference noted that the critical review carried on by Ravikovich is of practical interest.

The last report was delivered by A.I.Nikolayev, who discussed his own design for a new-type reactor for the hydrogenation of fuel.

The conference arrived at the conclusion that the papers discussed represent basically the results of original experimental investigations, executed at a high scientific level, under the supervision of qualified specialists, and with application of the newest and, in many cases, original methods. Publication of the proceedings of the conference was recommended. The need for similar conferences on a regular basis was emphasized.

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